

the authors not knowing exactly in which category to place them. The authors have examined 596 persons (383 men and 213 women), and found among them 76 "positive" (that is, capable of seeing photisms), and 520 "negative" (that is, incapable of seeing photisms). This proportion is about 1 to 7. Particulars of the examinations of all are given. The photisms for the same sounds differ much from individual to individual, but remain constant for the same individual, as shown by receiving identical answers to thousands of questions after intervals of more than a year. The photisms are not always distinct or of definite forms, but are projected on to the spot whence the sounds arise. Other senses produce sensations of colour as well as hearing; thus there are taste and smell photisms. There are also emotional photisms. The authors are unable to give any explanation, but they are clear that simple association does not suffice, and they examine a number of suggestions made to them, showing that they do not account for cases observed. They themselves think that the solution of the difficulty is to be sought in the nature of nervous processes, but they do not admit that "secondary sensations" are psychopathological. This little book is full of curious and interesting details evidently connected with Francis Galton's "mental images," and localisation and sometimes colouring of numbers in the mind's eye. The following account of the general conclusions obtained, given on the last page of the book, will show what a curious page of nervous physiology is here opened out.

1. *Bright photisms* are excited by musically high sounds, severe pain, sharply-defined sensations of taste, small forms, pointed forms. *Dark photisms* by the contrary.

2. *Musically high phonisms* are excited by bright light, clear definition, small forms, pointed forms. *Deep phonisms* by the contrary.

3. Photisms with sharply defined forms, small photisms and pointed photisms, are all excited by the sensations of musically high sounds.

4. Red, yellow, and blue are common colours of photisms; violet and green are rare, blue is of medium frequency.

5. Thorough agreement of the separate assertions of different individuals does not occur.

6. Unpleasant primary sensations may excite pleasant secondary sensations, and conversely.

7. Secondary sensations are scarcely more influenced by psychical circumstances than are primary sensations; and they are inalterable.

8. The disposition to have secondary sensations is hereditary.

9. Traces of secondary sensations are widely spread. Well-developed secondary sensations could be established to exist for one in eight persons examined.

10. Secondary sensations are not more frequently met with in psychopathically afflicted persons than in those of a normal condition.

*A List of European Birds.* By Henry E. Dresser. (London: Published by the Author, 1881.)

THIS "List of European Birds," including all the species found in the Western Palearctic region, has been very carefully revised by Mr. Dresser, and appears opportunely on the completion of his great work on the "Birds of Europe." It will be most useful as a check list for labelling, or for reference in making exchanges of birds and birds' eggs. The classification is the same as that adopted in the "Birds of Europe," and follows that of Prof. Huxley, which still appears to Mr. Dresser to be the best as yet elaborated. The species are numbered consecutively, in order to facilitate reference. A very few alterations in the nomenclature have been made: 623 species are enumerated, and the list is published at the low price of one shilling.

*The Seals and Whales of the British Seas.* By Thomas Southwell, F.Z.S. (with Illustrations). (London: Jarrold and Sons, 1881.)

THIS neat little volume, though it adds little if anything to our scientific knowledge of the British seals and whales, will be welcome to many as telling a good deal about these interesting mammals which could only be found after a prolonged search through many of our scientific periodicals. It will form a pleasant addition to sea-side libraries, and, telling what is known about these creatures, it may thus be the means of indicating what is not known about them, and so do something towards advancing knowledge. A good deal of the information in this little volume appeared originally in the pages of *Science Gossip*; it has however not only been carefully revised, but several additional woodcuts have been added. It has also had the supervision of Mr. J. W. Clark and of the late E. R. Alston.

The more advanced student would have liked a short chapter on the literature relating to our British marine mammalia, which perhaps in a future edition might be given, and an analytic key to the species of British cetacea would be a great help to those living in suitable localities who would venture to take up the study of these very interesting but not easily preserved creatures.

*A Sequel to the First Six Books of the Elements of Euclid, containing an Easy Introduction to Modern Geometry, with numerous Examples.* By John Casey, LL.D., F.R.S. (Dublin University Press Series, 1881.)

THERE are many geometrical results which are not directly formulated or stated in Euclid's Elements, which are yet constantly turning up in the solution of geometrical problems, and it is very desirable to have a handy book of reference, the propositions in which may be cited, so obviating the necessity of a lengthy proof. The "Exercises on Euclid and in Modern Geometry" of Mr. McDowell is a useful book for this purpose, as all the propositions are fully worked out. Dr. Casey, in the course of teaching, has frequently had to contend against the defect above referred to, and had to interrupt the course of the demonstration of an advanced proposition by turning on one side to prove some well-known result, because he could not cite Euclid as an authority for it. This handy little book, which appears to us quite up to the level of the author's reputation as a geometer, is intended to meet this felt want, and paves the way to a deeper study of the modern geometry contained in the exhaustive works by Chasles, Townsend, Mulcaby, and many Continental writers. A great number of classical problems are led up to, and they themselves discussed and established. The size and style of the book fit it for use in the higher forms of our schools, and more advanced students will find it a convenient book for citation.

*Accented Four-Figure Logarithms and other Tables for Arithmetical and Trigonometrical Purposes and for Correcting Altitudes and Lunar Distances, with Formulae and Examples.* Arranged and accented by Louis D'A. Jackson. (London: W. H. Allen, 1881.)

MR. JACKSON is an experienced editor and computer of logarithmic tables, having already published "Accented Five-Figure Logarithms," "Pocket Logarithms and other Tables," &c. Different calculations require different degrees of approximations, and the computer learns by experience which kind of tables are best suited for the end he has in view. In his Introduction our author carefully discusses the question, and states to what extent the present tables are efficacious. His system of accentuation appears to be a good one. Certainly it insures a much closer degree of accuracy than is to be got from ordinary four-figure tables. Each logarithm, on its face, shows whether it is in excess or in defect of the true value (obtained by taking a greater number of figures), or equal thereto. The range of error seems to be reduced to a

minimum. The worked-out exercises show that the mode of working is easy of apprehension and leads to correct results. A merit of the book, for frequent use, is that it is handy in form and very clearly printed.

### LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

#### The so-called "Bunsen-Pump"

PROF. ROSCOE, *President of the Chemical Society of London*, in enumerating the works of his friend Prof. Bunsen, says, in *NATURE* of the 28th ult. ("Scientific Worthies," vol. xxiii. p. 600):—

"To him we are also indebted for the apparatus for accelerating filtration, the 'Bunsen-pump,' together with all its appliances, now employed in every laboratory."

This assertion requires correction. The pump used by Prof. Bunsen for accelerating filtration was invented by me, and not by Prof. Bunsen, as would appear from the use of his name in connection with it. I described the construction of the "WATER-air-pump" distinctly and plainly in the *Journal of the Chemical Society of London* for January, 1865, under the title, "Researches on the Vacuum: I. The Instruments" (not the instrument, as some will read), and I sent a copy of this paper to Prof. Bunsen, inscribed with a suitable allusion to our former relationship as pupil and teacher, during the spring of 1865. Three years later Prof. Bunsen published his paper, "On the Washing of Precipitates," in which he described again my pump, but unfortunately omitted to quote my paper of 1865.

The following is a translation of Prof. Bunsen's own words:—

"To create the difference of pressure for filtration one cannot employ any of the air-pumps commonly used, especially not the mercury-air-pump, as the liquids to be filtered contain not unfrequently chlorine, sulphurous acid, sulphuretted hydrogen, and other substances, which would destroy the metallic portions of the apparatus. I therefore employ a water-air-pump constructed of glass on the principle of Sprengel's mercury-air-pump, which for all chemical purposes is, as I believe, preferable to every other apparatus for air rarefaction, where it suffices to push the rarefaction no further than to a pressure of mercury from 6 to 12 millimetres" (*Ann. Chem. Pharm.*, 1868, vol. cxlviii. p. 277).

The peculiar stress laid here on the uselessness of mercury-air-pumps, and on the fact that chlorine attacks mercury, combined with the omission of all reference to my paper, where both *water and glass* are mentioned, gave to Prof. Bunsen's description of the instrument a colour of originality which Prof. Roscoe (and with him many others) thinks right to support and to perpetuate by calling it the "Bunsen-pump."

As this misnomer has been already the subject of a disclaimer from Prof. Bunsen (*NATURE*, vol. vii. p. 241), of remonstrances both from myself (vol. vii. p. 241), from Prof. Frankland (vol. xiv. p. 74), and from others, I am sorry to see that Prof. Roscoe should continue to use this designation, which is intended to honour an "employer" of the instrument, which hurts the feelings of its inventor and deprives him of his only reward—the satisfaction of being credited with having placed a useful servant at the disposal of science and industry.

If any other inventor less eminent than Prof. Bunsen had made the omission which I have pointed out with much reluctance, no one would persist in giving his name to my child, nor (reversing the case) would anybody speak of a pump as "Sprengel's pump," if I had received from Prof. Bunsen the paper of 1865 and said in 1868, "I therefore employ a water-air-pump constructed of glass on the principle of Bunsen's mercury-air-pump."

H. SPRENGEL

Savile Club, London, May 7

[I have read the foregoing note of expostulation from Dr. Sprengel, and I regret that I have hurt his susceptibilities. That Dr. Sprengel first enunciated the principle both of the water- and of the mercury-air-pump no one can doubt. But that Bunsen

devised a water-pump suitable for filtration there can be as little doubt. Hence in speaking of a "filter-pump"—as every chemist knew I was doing—as contradistinguished from an "air-pump," I conceive that I am justified in using the words "Bunsen-pump."—H. E. ROSCOE.]

#### Tide-Predicting Machines

THE recent discussions respecting tide-predicting machines have called to mind a very old invention of my own, which, although originally designed for a different purpose, seems to me capable of solving the required problems with all attainable accuracy.

I communicated to the British Association at Cambridge in 1845 "A description of a Machine for finding the Numerical roots of Equations and Tracing a variety of useful Curves." An abstract of that paper may be found at pages 3, 4, of the *Transactions* of the sections. About the same time I lithographed for private distribution a more detailed account of the proposed machine, illustrated by diagrams. It begins with the remark that "Persons engaged in testing theory by experiment have frequently derived great assistance from mechanical contrivances, which give rapid and near approximations without the trouble, in every separate case, of going through tedious multiplications and additions. The proposed machine would be capable of giving values of  $\sum \{b \cos(n\theta + a)\}$ , or of tracing the curve  $\rho = \sum \{b \cos(n\theta + a)\}$ ."

At page 2 it is shown how it was proposed to trace the curve  $\rho = a + b \cos(n\theta + a)$ . It is then remarked that, in the same way, it would be possible to trace the curve  $\rho = a + b \cos(n\theta + a) + b_1 \cos(n_1\theta + a_1) + b_2 \cos(n_2\theta + a_2)$ , &c. Then follow a variety of suggestions for the practical use of the instrument, and at page 7 there are the following suggestions for the construction of a machine:—

"As toothed wheels cannot be employed to turn the circles ( $A_1$ ), ( $A_2$ ), &c., I have made use of a combination of the endless screw and toothed wheels so that the error of the wheels is almost destroyed. *H* (Fig.) represents a handle attached to an axis on which are mounted toothed wheels  $t_1 t_2 t_3 \dots$  which gear with the wheels  $T_1 T_2$ , &c., mounted on separate axes, each having a portion of a very accurate screw. These act on the circumferences of the circles ( $A_1$ ), ( $A_2$ ), &c., and cause them to revolve uniformly, as in Ramsden's dividing engine, &c." The large diagram shows four of these ( $A$ ) circles, each of which gives one term,  $b \cos(n\theta + a)$ , and these terms are summed by the help of a chain, such as is used to wind up watches, passing over pulleys carried by frames free to oscillate in parallel directions. I inclose copies of the lithographed description of the instrument.

May 9

F. BASHFORTH

#### Sound of the Aurora

IN *NATURE*, vol. xxiii. p. 484, one of your correspondents speaks of the sound of the aurora as "crackling," or as that of "the flickering of blazing fire," while another describes it as like the "rustling or switching of silk." On Monday, April 12 last, there was an electric storm here, and at 7 p.m. when I walked home (the blazing lightning leaving but *momentary intervals* of darkness), I heard all round me the constant crackling or rustling of blazing flames. Towards the north-west across a low arc near the horizon pale sheet lightning swayed quickly to and fro. There was no rain at the time, that came heavily afterwards. The sound of flames was close round me, and others had the same experience. No one I can find has ever seen lightning so completely fill the air or heard such strange sounds.

F. C. CONSTABLE

Karachi, April 25

#### Meteorological Bibliography

I AM compiling a classified bibliography of meteorological science, and being desirous of rendering it as full as possible, I should feel much obliged if you would intimate to meteorologists that by sending copies of their papers to me they would do much towards helping on the work. The publication of this bibliography has already commenced in "The Scientific Reil."

6, Kent Gardens, Ealing, W.

A. RAMSAY

#### An Optical Illusion

THERE is an exquisite optical phenomenon of which I (and doubtless many others too) would be glad to see a really scientific